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SIGMA XI QUARTERLY

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The record of the new Texas Chapter which was duly installed on May 17 by ex-President, Professor S. W. Williston, arrived in time for this number but the limitations of space necessitated postponing its printing. It will be published in the September number. The official list of chapter officers, given on the third cover page, includes those of Texas as well as those in the District of Columbia.

SIGMA XI QUARTERLY

EDITORIAL COMMITTEE

Edward Orton, Junior — Henry Baldwin Ward
Floyd Karker Richtmyer — Samuel Wendell Williston

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COLLEGE FESTIVALS

American colleges and universities have grown riotous in celebration. Whenever an institution gets a new president, or a new building, or a new endowment, or a new championship, or even an unexpected victory, another special celebration is added to the long list of regular festivals which like the "home-coming," the interscholastic, the intercollegiate, and the military days are given official sanction by being incorporated into the calendar as annually recurring events. A casual examination of some college catalogs shows only two fixed events that bear any direct relation to scholarship; examination week and Commencement Day! The former ranks in the student mind as an occasion to be celebrated in retrospect and the latter has become a whirl of social gaieties that leave little time or energy for the serious side of a festival of learning. In order to lay greater emphasis on scholarship Phi Beta Kappa long ago introduced a more serious note into the program of Commencement week, but at best its influence reached the faculty and alumni rather than the undergraduate body.

♣ ♣

When Sigma Xi came into the field it sought also to influence the institutional life through this same ancient festival occasion by a scientific address which in some places was added to the program of Commencement week, and in other cases alternated biennially with the Phi Beta Kappa address or took its place at a new midwinter commencement celebration. But in most places the whole Commencement environment of season, visitors, work finished, and vacation in sight is not favorable to serious consideration or scholarly presentation; so learning languishes and an apotheosis of scholarship is not imminent in the college world.

♣ ♣

Within recent years these two societies coöperating for the encouragement of scholarship have started in certain institutions

upon a new line of attack. They have drawn away from the commencement season and have inaugurated at another period in the regular work of the college year a festival of learning which they hope and believe will come to occupy in the mind of the undergraduate as distinctive a place as any athletic or social celebration in the calendar. This is a flanking movement of great sagacity. It finds the student totally unprepared to resist and ready to lend ear to the charms of true learning. The advantages of such a plan are so evident as to need no explanation and the outcome of the experiment will be watched with keen interest by all. It is in any event an important contribution to educational methods.

♣ ♣

Data are not available to show when the plan was first tried, what institutions have followed in the attempt, or how far the movement has met with success. Consequently any definite record is of value in the discussion. At the University of Illinois this year it was the turn of Sigma Xi to secure the speaker and make other arrangements for the joint meeting, which has heretofore always been held in the Commencement week. Impressed by the possibilities of the new scheme, Sigma Xi proposed to Phi Beta Kappa that the meeting be held at a much earlier date in order to call the attention of students to the two organizations and their purposes. After much discussion a date early in May was decided upon and the results fully justified the change. The speaker, Dr. George Otis Smith, Director of the U. S. Geological Survey, had an audience several times as large as the other date had ever yielded, and the number of students present was far greater while the report of the meeting published in the University and town papers provoked much desirable discussion in the student body on the work and aims of the two organizations. The address delivered on this occasion appears as the leading article in this number of the QUARTERLY.

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The formal establishment of the first Alumni Chapter is recorded in this number. The District of Columbia Chapter starts with a chapter roll which is truly imposing and which demonstrates beyond cavil that Sigma Xi renders great service to the country. Our members appear in every branch of government service and those familiar with individual contributions will recognize that these are they who are laying the foundations of knowledge on which the progress of so much government work absolutely depends.

PRACTICAL IDEALS

GEORGE OTIS SMITH

Men agree that times change. But whether we are reviewing geologic eras or epochs of human history, it is true that certain of these periods of time are characterized by much more rapid change than are others. Neither the rate of earth evolution nor that of human progress has been constant. In this twentieth century we look out upon an environment peculiarly adapted to the rapid generation of ideas and their almost instantaneous world-wide dispersion. An idea can encircle this globe in a few hours, and within the week, stand out on the printed page in all the languages of the civilized world.

As we watch the progress of the European War, many exclaim "This is a year when history is in the making." Yet is it not a fact that more history is made in the interludes of peace, than in the crash of battle? On this side of the Atlantic the last decade has been marked by permanent advances no less striking than the shifting fortunes of embattled nations during the last ten months.

A statesman is defined as a politician who has died. Too often we are tardy in our recognition of the worth of men and also of the significance of events; we overlook the true meaning of the passing show. The essayist Freeman tells us that history is past politics and that politics is present history. To the American citizen concerned for the future of his country, there can be no subject which better deserves attention than present-day politics.

The creation of public sentiment is not a monopoly of the reformer, nor is the cultivation of ideals the exclusive privilege of the scholar. Real progress in the world of today is the product not of a simple process of thought, but of a complex reaction between practice and theory, between the ideal and the practical.

"Practical ideals" is thus more than an apparent contradiction of terms—it is the real thing that the world demands. The practical ideal is the ideal of its everyday form that has the power to uplift because it is firmly braced on the ground. Just as the facts of the mine and furnace and rolling mill must be used in the laboratory of the technical school, so on the other hand the ideals of the

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Address delivered at the Annual Joint Meeting of Sigma Xi and Phi Beta Kappa, University of Illinois, May 4, 1915.

university need to be taken into the market place. Here is the proving ground where theory encounters fact, and where opinions are put to the acid test of experience.

Today, the political problems of the country are in large measure business questions. One nation-wide inquiry is before the people as never before—what is the relation of government to business? This practical working out of the equation between common good and private right has been the task of society since history began, but in our generation the issue is sharply drawn as perhaps never before. The leaven of unselfish concern for our neighbors has been working through the mass of public opinion, and now the people in general desire the greatest good for the greatest number. Ideals of this type, however, are intensely practical. Public welfare must be defined in terms of steel works and shoe factories and flour mills rather than in legalistic formulæ; the full dinner pail remains the practical ideal that the average citizen can best understand.

Present-day reformers like William Allen White and Shailer Mathews have not been the first to proclaim that "the old order changeth, yielding place to new." Down through the centuries of recorded history, while human nature has remained much the same, social conditions have changed almost without pause. Many reforms, however, are now being realized so rapidly that what is a commonplace in 1915 was at best only a vision when this century opened. The "impossible" is being enacted into effective law so frequently now that only the blind can fail to read the signs of the times.

Last winter at a Senate Committee hearing when water power legislation was under discussion, the usual conflict of thought developed between the lawyers who cited the limitations set by the Constitution, and those of us who urged the needs of the public. In an attempt to define this antagonism of opinion, I repeated to the Committee my remark to an eminent lawyer after hearing his constitutional argument. "It seems to me that the chief difference in our points of view" I said, "is that the student of the law thinks what can not be done ought not to be done; while others of us believe that what ought to be done can be done"; or as I would express it tonight, the ideal can be made practical.

These rapid changes in the social order, of course, necessarily follow the increasing complexity of civilization, yet I venture to suggest that none of us comprehends the full extent of these

changes in commerce and industry. It has been figured that it would take a caravan of half a million camels to transport the wheat which in a single day passes over any one of our great railroad lines during the season of crop movement. And when it comes to the product of our coal mines, which furnish the staff of life to America's industries, the camel as a unit of transportation can not be used in any simple calculation; for a year's output of the coal mines of this country would fill more than eleven and a half million of our largest coal cars, or a train long enough to encircle the globe three times at the equator.

I am hinting at the differences between the world of today and that of yesterday; you students of engineering science know how rapid is the march of improvement in industrial processes and methods. The scrap heap is piled high with machinery that only a few years ago won and deserved the admiration of the world but that is now displaced by something more efficient. And all this progress has affected the problems of government, and more particularly those of a democratic government. Changes so marked in the material or business environment compel social and political reconstruction.

The new political economy, as I see it in the making, is putting a larger emphasis upon the interdependence of all members of the community—in fact, it is the community idea that stands out. The brotherhood of man is an ideal constantly preached to mankind for nineteen centuries, but now this ideal has become a practical factor in affairs of State. The moral element in the economic questions before the public is not to be overlooked, and recent progress in this respect has been most striking. Take for illustration the law protecting women factory workers; on the question of its constitutionality the highest court of New York reversed itself within eight years, the justices holding that the health of women is a matter of vital importance to the State. Within these few years the attitude of both the public and the court has radically changed.

The intimate union of the practical and economic with the ideal and moral may be seen also in the liquor question. Most striking of the war measures taken by the great European nations have been those aimed against the drink habit—simply in the aid of efficiency. So too, in this country, the political question of suppressing the liquor traffic has become hardly less an economic than

a moral issue. The interest of the citizen in his fellow's welfare thus becomes real and active in a highly organized democratic civilization.

Altruistic democracy is not a meaningless phrase. The Declaration of Independence begins with altruism in the appeal it makes for the pursuit of happiness. Democracy in its essence means equality of opportunity; its function is to build up to the higher plane, not to cut down to a dead level. And in our Constitution, the declared purpose to "promote the general welfare" is a guarantee that this nation takes no narrow view of business questions such as those now before the American people. It is in human welfare that ethics and economics find common ground.

Too much stress can not be placed upon the human factor in these problems. The student of politics does well to think less of artificial measures of value, to talk less of monometallic or bimetallic standards and to realize that the human standard is the real measure. Reduced to simplest terms, property, whether real or personal, gold or silver, prairie land or skyscraper, derives its value from what man's labor has put into it or can take out of it.

Whether we look out upon the world of work with confidence or with alarm, it is agreed that the period of adjustment of business to law is well under way. A working minority of American citizens has come to realize that unregulated, private monopoly and good citizenship are antagonistic terms. And, now that popular clamor is giving place to sober second thought, the other side of the monopoly question is receiving the consideration it deserves; there is a widespread recognition of the common interdependence of big business and the general public. On the one side, the people are realizing that they are and have been in reality, silent partners in big business, and now that there has come the promise of some regulation that will in large part prevent monopolistic centralization, the people are interested in getting their share of the returns which can come only with operation at a profit. On the other hand, the managers of the large corporations, who are really the trustees of the investing public, are beginning to see that a certain financial security goes with public confidence. The people can not be left out of the reckoning, and that well-remembered attitude toward the public so tersely expressed thirty years ago by a famous pioneer in railroad affairs does not pay dividends today.

Productive industry in large units is coming to be placed in the public service class. Three parties at least are involved in the

business of an industrial plant—the employer, representing those whose money makes the business venture possible; the employee, whose labor is the lifeblood of the enterprise; and the consumer, who depends upon the product. In a single business of this type the owners may be a few capitalists or several thousand stockholders, the employees may be numbered by the hundred or by the thousand, and the consumers may aggregate hundreds of thousands. The significant fact, however, is that every member of each class has a real and a legitimate interest in the success of the business.

The extent of the share which the consuming public has in the conduct of certain industrial operations on a large scale is being recognized in the courts. In a recent decision in New South Wales, for instance, the court upheld as legal and in the public interest, certain trade agreements among coal-mining companies and shipping companies. From New South Wales it is a long, long way to Illinois, yet the conditions in the coal fields of these two States may not be altogether diverse. In that far-away country, cut-throat competition had followed the development of a new field with the result that prices prevailed which the court described as disastrously low. The justification of the combination was stated by the court with a logic that appeals to the nonlegal mind. "The consumers of coal will lose in the long run if the colliery proprietors do not make fair profits or the miners do not receive fair wages."

Coming back to the same probiem nearer home, I may mention a fact which may not have been given publicity. More than once in the last six years strong delegations representing large bituminous coal-mining interests have come to Washington seeking authority for a trade combination. The purpose of such a combination was not concealed—it was to raise the price of coal so as to make the business truly remunerative; but in order to secure a price properly related to cost, these hardheaded men of "big business" proposed that the fixing of that price should be absolutely under Federal regulation. I believe they had a good case, and although they urged something for which the times were not ripe they were in fact presenting a proposition promising as much to the public interest as to their private gain—this will be a practical ideal as soon as legislation catches up with business.

The competitive element in business need not be thrown aside—it has not outlived its usefulness. But competition must be fair. For big business or for little business government should lay down

the rule that the winning of a market naturally follows the proffer of better quality or lower prices. The buyer, whether he lives in a South American city or on a New England farm, wants the most and the best for his money. Enforce this rule, and trade competition will resolve itself into a contest decided by the constructive contributions made by the inventive organizer and the skilled laborer. In short, the goal of fair competition is excellence of product secured through efficiency of producer.

The question recently put to counsel for the Harvester "trust" by Chief Justice White was pertinent and possibly highly significant. At least the attorney was not prepared to answer this simple question: "Why not expansion of business along customary lines?" It is the unfair competition that our antitrust statutes have attempted to prohibit—competition of the sandbag variety by those raiding promoters whose operations have given a bad name to Wall Street and other financial districts. On the other hand, competition that is a contest of technical efficiency is the highest expression of industrial progress; it is a natural process in economic evolution and will result in the survival of what is truly fittest.

The "open door" in China has been the text for many diplomatic papers, yet the open market at home is far more important to free America. Of course, all manufacturers can not enter every market on exactly equal terms; but the advantages belonging to the successful competitor should be only those belonging to him by reason of natural and economic law, such as the strategic geographic location of his plant or his higher efficiency in factory and office. The list is long that sets forth the unfair tactics employed by the large corporations in the last decade, and indeed before that by their smaller predecessors—let us pass all that by as the highly finished product of misdirected genius.

Has it not occurred to you that too often business has been conducted as a war? The destructive effects of such a struggle have usually overshadowed any possible constructive purpose, because it has been a contest of brute strength in which all law, natural, statutory, and moral, is forgotten. Yet, our fellow citizens who have directed this kind of warfare in the forenoon seated at their office desks may go to the Country Club later in the day and be scrupulously exact in their observance of the rules of the game on the golf course or on the tennis court. Why two codes? Some of you may recall a short story published a year or so ago which

presented this same problem of everyday life. The question can not be dodged, whether asked in the highest court of justice or on the printed page of a popular weekly, or at the desk in our private offices—why not play the game of business with the one purpose of winning fairly by skill and strength and with the fixed resolution of not conquering by stooping to practices that must be hidden?

We perhaps should confess a fondness for key words around which to group our thoughts, and preferably such words as may be spelled with a capital letter and used as a rallying cry in spreading a new cult. Conservation was such a word a few years ago, and possibly you may detect me placing a similar emphasis upon the term Efficiency. But both these words, which have been displayed so frequently on the printed page in the last decade, are simply new names for an old idea. Yet this same protest against waste of material resources and of human energy is winning a larger place in the life of the American people—the propaganda has made an ideal practical.

The increased efficiency now demanded by the public is in many cases dependent upon monopoly, or at least upon large units of operation. Perhaps no better illustration can be given of the benefits naturally following "big business," in this sense, than the record of the electric light and power business in Chicago. In ten years the Commonwealth Edison increased its output of electricity fifteen-fold with only a four-fold increase of its investment. There is a real public interest in this fact that where in 1903 the dollar invested by the company in generating plant and distributing system yielded 3 kilowatt hours to the consumer, in 1913 the company's dollar delivered 10 kilowatt hours. Engineering efficiency of that type makes possible a material lowering of price to the people, and the increased business thus stimulated in turn makes possible further reduction of cost. This not unusual interrelation between producer and consumer leads us to inquire to whom belong these attendant benefits of efficiency.

It may be well to look at the business of the country in a somewhat larger way. A few months ago I had occasion to consider the advances made in the mining industry, and my analysis of certain statistics of production yielded most gratifying results. In coal mining, the phenomenal increases in output have been brought about in large part by gains in efficiency. In twenty-five years the mine-worker increased his individual output more than 60 per cent;

that is, where in 1889 the average miner produced 471 tons of coal a year, in 1913 his output was 762 tons. The iron mines of the country show an even better record, the annual output of ore per miner increasing in twenty years from 385 to 995 tons. These are plain everyday facts that may not lend themselves to rhetorical statement, but they constitute a real contribution to the logic of events. Man's productive capacity is showing these marked increases, and economic benefits must surely follow.

To whom, then, belongs the reward of efficiency? I find a simple answer to that question in the opinions of the higher courts, in the decisions of public utility commissions, and in recent or pending legislation. Industrial enterprises as conducted by corporations are inherently coöperative. Owner, workman, and consumer are in reality partners, and as such deserve to share in the profits. The public can demand low prices only after adequate profit has been provided for capital, and fair wages for labor. This basal principle of profit sharing among all three partners seems to me the corner stone among the practical ideals of the present day.

What has been vividly described as "the industrial tug-of-war" simply results from the manufacturer striving for lower costs at the same time that the workman is pulling for higher wages. But is this opposition of employer and employee necessary? Scientific management has given the answer by proving that in many industries low labor costs and high wages are not antagonistic. Motion studies have determined how the workman can use his time and strength with the least amount of waste; efficiency tests have resulted in standardizing tools and simplifying processes; and improved pay systems put a premium upon the efforts of the workman to make the largest use of himself and the machine he operates—these are the methods that have made possible at one and the same time lower costs and higher wages. Henry Ford is authority for the statement that the profit sharing plan has resulted in "a voluntary increase in efficiency of the force of from 15 to 20 per cent."

This idea of partnership brings us logically to the question of the determination of what is just and fair compensation to both capital and labor. "Minimum wage" and "living standard" are terms used in society's effort to protect the workman, and we all endorse the crusade against the sweat shop, not only because we may have humanitarian ideals, but also because underpaid labor expresses bad business. "Sweating" is neither ideal nor practical.

However, I wish to remind you that capital as another partner in the business deserves its share, and its minimum wage must also be determined. The old fable of the goose that lays the golden eggs is applicable to present conditions in the business world. Capital must receive a living wage, else disaster will follow, in which the other partners will surely share. Bookkeeping that makes no allowance for maintenance and replacement of plant, representing the capital outlay, is no better and no worse than the cost sheets which include wages that can not maintain the workmen in health. Business that is solvent must pay in full both labor costs and capital costs.

There is a kind of social accounting that counts all the costs in the industrial world. The various laws that have been enacted within a decade—employer's liability, workmen's compensation, and widowed mother's pension—all these are expressive of humanitarian economics and provide a type of social insurance. This effort to make the community bear the burden resulting from accident to the individual wage-earner is in line with the idea of distributing the risk and especially in a democracy is economically correct.

There is, however, another risk which in the last analysis the public must share, in so far as government can not reduce this risk. I mean of course that "Safety first" is a practical ideal to be applied to financial management as well as to machinery operation. Yet some risks can not be avoided, and both workman and capitalist have a right to demand social insurance.

As I see it, risk is the one item of cost which every business man seeks to eliminate. Wherever present, this possibility of loss must be offset by a possibility of profit above the rate of interest earned by the most conservative investments. The industrial stock must possess greater earning possibilities than the "gilt-edged" bond. It is easy to see that in the end our friend, the ultimate consumer, pays for this insurance against loss; and to reduce the real cost of some of the necessaries of life, whether commodities like coal, or service like electric lighting, the effort should be to increase the certainty of investment and the regularity of employment. Both plant and workmen require larger daily compensation if employed for only a part of the year than if running at full time for the twelve months. Thus it follows that business confidence and security is something in which every citizen has an interest, whether he be consumer, workman, or investor.

Public regulation of business is the natural outcome of this growing complexity of industrial society. How different were the industrial conditions of a century ago. The independence of those days, when most of the articles needed by our grandparents were made in the home or grown on the farm, has been described in the lines:

"Home was a factory, life a trade,
And Mother a Captain of Industry."

Contrast with that independence the present system under which your dinner table may represent the tribute from several continents and your home contain the products made by a dozen so-called trusts. Thus as consumers we have become dependent upon the big corporations which produce and transport these necessaries of life, so that public regulation of private business is justified.

It is well for us to observe from time to time the trend and progress of events. The trouble with too many of the business men of the day, and especially with those who come to Washington to oppose new legislation, is their nearsightedness. They can not see country-wide public opinion and do not appreciate the obvious fact that the financial centers are not also the centers of national thought. The result of this, as I expressed it in conversation last winter with a New York gentleman who was largely interested in water-power development, is that the business interests oppose something at one Congress which two years later they would accept; but the next Congress is already considering a more advanced legislative proposition. We are all more or less progressive, I told him, but the opposition has been just one lap behind.

Let us face this issue squarely. The purpose of government is to protect the people. The question of public regulation of business is no longer debatable except as regards degree and methods. Review with me in a glance the progress made on this issue. To show the sentiment of ten years ago, take ex-Secretary Olney's contribution to the discussion of the large question then before the country; namely, the public regulation of railroad rates. Mr. Olney's argument was that the rate-making power is the very essence of the ownership of the transportation business; that rate-making by legislative act and judicial review is so slow a process that its result would be confiscatory; that the organic inability of the Federal Government to own and run railroads of the country includes the inability to fix rates, a right inseparably linked with

ownership. The legal and constitutional difficulties thus presented by Mr. Olney were strengthened by economic and business objections of the score of public policy which he regarded "as obvious as they should prove insuperable." Yet, today, the Federal control of interstate commerce and the State regulation of interstate transportation is a commonplace in the business world; for eleven years the Federal Government has owned and operated a railroad on the Isthmus; and within a month the President has authorized the puchase of a railroad in Alaska as the first section of a line to be constructed by Government engineers.

Regulation by the Government, moreover, means the protection of the corporation as well as of those served by the corporation. The fear that the courts could not safeguard the interests of all has proved groundless. Two recent decisions by the Supreme Court may serve to illustrate this. The public service character of a railroad does not exclude the essential idea of a reasonable reward. Government control, whether State or Federal, can not be arbitrary; facts of profit and loss must control questions of rates. In the Norfolk and Western case the Court decided that the fixing of a two-cent rate is not justified if thereby merely a nominal profit is earned on the interstate passenger business. The Northern Pacific decision is even stronger in the Court's limitation of legislative powers. North Dakota had sought by statute to fix rates for coal that would promote the utilization of the lignite of that State, a policy in line with conservation. The court, however, states that the public interest can not be invoked as a justification of arbitrary demands that require transportation of freight at less than the proper cost, or even virtually at cost, and thus deny to the railroad a reasonable reward for service. The public can not even require a railroad to carry coal at a loss, on the supposition that the receipts for the carriage of wheat will show a profit on the freight business as a whole.

The dominant principle in these and other recent decisions is that in its regulation of private property devoted to public use, the Government exercises its protective power both toward the public user and the private owner.

Public utility includes the idea of monopoly of market, a monopoly in part of natural orgin, in part of governmental creation. The public by its franchises and charters contributes to the enterprise, and even where the monopoly is largely of natural origin, as

in the case of a great water power, this bounty of Nature should be regarded as inherently belonging to the people. On this phase of the subject the New York public service commission pointed out that for the citizens of Buffalo not to secure the advantage of the cheap electric energy possibly through the use of the waters of Niagara would be a result that "will never satisfy the elementary sense of right and justice in the mind of any man." Thus the people must be counted as a partner in the public utility business. There have been several methods of carrying out this partnership idea, such as grading the taxes by the corporation receipts, or dividing certain parts of net revenue between the city and its franchise holder.

Again, the public interest is recognized through the increasing attention given to the requirement of standardized systems of accounting. Nearly ten years ago an executive of a large railroad system, who is perhaps the leading authority on railroad accounting, remarked to me that the Interstate Commerce Commission had one thing to its credit; it had forced the railroads to keep the proper kind of books. It is plain that the accounting which is now being prescribed by the various public service commissions will also prove beneficial not only to the public in general but to the management and the investors in particular. Too much has been concealed by skillful bookkeeping—wasteful operation as well as questionable financiering.

The bright light of publicity is coming to shine more and more upon the inner workings of all private business which has anything of the public service character. Publicity is logically and practically the first step in effective regulation by the people. Lest some of you may share in the narrow view that regards regulation as a synonym for interference, allow me to repeat that if we recognize the people as a partner, possessing a common interest in the profits of the business, sympathetic coöperation should be expected. The practical ideals of both private owner and public user of a modern public utility like an electric light plant or a street railway system, are to lower prices by keeping down costs and to improve service by increasing output.

This publicity method of safeguarding all concerned is surely coming. Only about three years ago, at a conference on water-power policy, I heard the representatives of the banking houses interested in the hydroelectric business tell the Secretary of the

Interior with considerable warmth of spirit, that one thing the men who make possible the development of our country by their contribution of capital would not stand for, was any legal requirement of inspection of their accounts by the government. A corporation has its rights, they continued, just the same as a private man in business. Last year in the same room, when the utilization of a large power site owned by the government was being disucssed, I heard those asking for the permit dismiss the question of Federal inspection of their books with the remark, "That need not be discussed, our books will of course be always open to any authorized representative of the Government." The ultimatums pronounced by the ambassadors from Wall Street or State Street, are short-lived in the present atmosphere of popular interest in these business questions.

In outlining the duties of the New York Constitutional Convention recently, ex-Senator Root mentioned the great changes in the industrial and social life of the State and said:

"To attain the ends which everyone agrees ought to be attained, it appears necessary that government shall interfere to a much greater extent than in former times with the complicated and interdependent life of the people."

This keynote was sounded not by a radical bureaucrat but by a conservative legislator and executive of the widest experience.

My outline of these business questions of national magnitude has as its purpose the suggestion of what constitutes the trend of national progress. I believe party leaders and citizens generally are seeing the same patriotic vision of the true meaning of democracy. The altruistic spirit which makes ideals practical is becoming a vital power with men and women all over the land. The truly great citizen is he who foresees the resistless force of real public sentiment and adds his constructive effort in the right direction. Henry Watterson, in his masterful oration on Abraham Lincoln, mentioned the spectacular debate of "Titan against Titan" here in Illinois. "But," Mr. Watterson remarks, "in that campaign, from first to last, Judge Douglas was at a serious disadvantage. His bark rode upon an ebbing tide; Lincoln's bark rode upon a flowing tide."

The ideal of popular government moves forward just as fast as the average citizen grasps the new concept of citizenship that puts duties ahead of rights and obligations ahead of privileges. Presi-

dent Wilson a few months ago pointed out the "splendid side" of war as the "consciousness that a whole nation gets that they must all act as a unit for a common end." We enjoy the blessings of peace, yet we must face the exacting demands of the day and respond to the call for citizens. With the great advances in our complex civilization, popular rule has become more difficult. The Illinois voter on the practical issues of the day keenly realizes limitations that never troubled the citizen of Ancient Athens as he sat in the market place discussing the matters of his little State. Citizenship today is no easy task.

Most important, therefore, is the contribution of the higher education to American citizenship. A few of you—let us hope many of you—may enter the public service and serve your home town, your State, or your nation as responsible and responsive public servants, efficient because expert, faithful because patriotic. To all of us, however, comes the opportunity and the obligation to be citizens and to take the duties of citizenship no less seriously than we would those of public office. It is you to whom the nation must look not so much for officeholding as for leadership in public opinion.

One who was in close touch with the student body of Princeton and now serves humanity at The Hague has said that service in the cause of one's country and one's fellows is "work well worthy of the finest manhood and womanhood. The well-born are those who are born to do that work. The well-bred are those who are bred to be proud of that work. The well educated are those who see deepest into the meaning and the necessity of that work."

The happy union of the humanities and the sciences represented by the joint meeting of these two honor societies typifies the requisite training of a citizen qualified to take a place in the world of today. In order to fit himself for a life both successful and happy, the scientist or the engineer needs to be first of all a man. We need to see ourselves and our day in the right perspective. To give the present its proper background of the past, acquaintance with the humanities is essential; and to throw upon the activities of today the prophetic light of what the future may hold for humanity, knowledge of the sciences is necessary. Men of vision are what the world needs, but vision alone will not suffice. It was not a Darius Green, but Professor Langley and the Wright Brothers who taught men to fly.

With due respect to my fellow members of Phi Beta Kappa, may I emphasize for a moment the importance of what is represented by Sigma Xi? It is simply axiomatic that the world has reached the stage where science has entered everyday life to a degree that even our fathers never dreamed. Physical forces and natural resources are harnessed to the use of men, and the miracle workers who can control these Titans are essential members of the body politic.

Kipling has paid his tribute to the engineers and their manifold duty in this world of work under the title of the "Sons of Martha," who "favor their mother of the careful soul and the troubled heart." Let me quote in part his verses:

"It is their care in all the ages to take the buffet and cushion the shock;
It is their care that the gear engages; it is their care that the switches lock;
It is their care that the wheels run truly; it is their care to embark and entrain,
Talley, transport, and deliver duly the Sons of Mary by land and main.

"They say to the mountains, 'Be ye removed!' They say to the lesser floods, 'Run dry!'
Under their rods are the rocks reproved—they are not afraid of that which is high.
Then do the hilltops shake to the summit; then is the bed of the deep laid bare,
That the Sons of Mary may overcome it, pleasantly, sleeping and unaware.

"They do not preach that their God will rouse them a little before the nuts work loose;
They do not teach that His Pity allows them to leave their work whenever they choose.
As in the thronged and the lightened ways, so in the dark and the desert they stand,
Wary and watchful all their days, that their brethren's days may be long in land.

"Lift ye the stone, or cleave the wood, to make a path more fair or flat,—
Lo! it is black already with blood some Son of Martha spilled for that.
Not as a ladder from Earth to Heaven, not as an altar to any creed,
But simple service, simply given, to his own kind, in their common need."

The compelling argument for engineers to step forward as citizens is the evident fact that politics has not kept pace with science. Take the political conditions of this or any other country, of this or any other day: they are characterized by uncertainty, confusion, and hazards that the business man would at once cut

out of his own business and should eliminate from the nation's business. On the king's highway of ancient times, slaves worked without respite to make smooth the path for royal use, and today the American railroad invests millions to straighten curves or reduce grades, but on our political right-of-way, obstructions and obstacles which make all progress expensive, if not uncertain, are allowed to remain simply because these so-called institutions are our heritage from our fathers and our fathers' fathers. To look backward and to search for precedents seems to be more than a habit with statesmen; it is rather a part of their professional code.

Sigurd Ibsen, son of the dramatist, in his volume of suggestive essays entitled Human Quintessence, has used an expressive term—*the lag of politics.* As you students of mechanics might state it, the mass conditions of state-craft are expressed as inertia while those of science are expressed as momentum; the one is static, the other dynamic. As Ibsen himself states it: "What is called conservatism or maintenance of tradition consists in large part in efforts to lengthen the shadow life of by-gone thoughts and orders; it is the past that shall decide for the present, it is the dead that shall rule over the living."

I believe it was Carlyle who termed the French Revolution a revolt against formulas, but political formulas influence majorities even in this twentieth century, and "evolution rather than revolution" is the catch-phrase of the conservative politician. The absurdity of the political logic which opposes direct transition to up-to-date conditions is strikingly exposed by Ibsen. "Suppose," he says, "a little town which has until now got along with oil lamps, wishes to introduce electric lights, its water power being easily accessible and cheap, and an official comes along and says that temporarily they must erect gasworks, as historically lighting by gas is the intermediate step."

My own university takes as its motto in all its departments, words that have lost none of their force through the centuries—"The truth shall make you free." In American politics the "new freedom" is this same old freedom that comes from fidelity to truth, because it is the only freedom possible. In working out the practical ideals in politics the citizen trained in the exact sciences is qualified to render yeoman service.

Optimism that expresses a faith in the verities of life is a possession that we all should seek, but that brand of optimism that

comes only as we close our eyes to the hard facts of past experience and present observation, is something to be shunned. It leads states as well as individuals into dangerous places. Especially do we need to beware of optimistic mathematics—the type of impressive statement that presents figures which run into several decimal places but that wander far beyond the confines of truth, simply because every doubt is resolved in favor of the object of inquiry and no factor of safety is introduced. You who are favored with an engineer's training have no excuse for taking chances in either your personal or your civic lives which you would never think of introducing into your designs for a skyscraper or a railroad bridge.

President Wilson has stated that at Princeton he learned that the men who dominate modern industry "could not conduct their business for twenty-four hours without the assistance of the experts with whom the universities are supplying them". If, then, American government is lagging behind American business, the only relief lies in this call for college and university graduates to become citizens in the largest sense of the word. It is for you men and women to recognize all that this call for citizens means and what your duty to the public may involve.

Not only is the scholar and the idealist essential to the civic life of today, but he himself needs just this intercourse with his fellow men. The scientist who simply seeks truth for truth's sake will surely lose the largest part of life, for truth that serves man, science that benefits humanity, is the only kind whose quest is worth making a life work for a man with red blood. The scholar whose horizon is limited by his library shelves or the scientist whose insight into the problems of life is gained only through the tube of his microscope is too often regarded as the one who really consecrates his life to the cause of truth and who unselfishly chooses the highest type of life. In reality, such scholarship is too self-centered to find its highest expression.

Scholarship in action has been claimed as the real fruit of our higher education; Ostwald defined a great man as "an apparatus that can render great performances"; and Professor Gildersleeve said "Everything except service is naught". Action, performance, and service, however, mean little except as we see the purpose and the direction. Good citizenship that will meet all these requirements—whether does it tend? What will it accomplish? These are ques-

tions that the student of natural law very properly may ask, and they deserve far more consideration than the queries of the self-seeker—What will it pay? or What's the use?

The most philosophic of American geologists, Professor Chamberlin, after studying exhaustively climatic conditions in the long geologic past and after weighing carefully the possibilities of disaster to our earth from collision with some star, has shown that we have good reason to measure the future habitability of the earth at millions or tens of millions if not, indeed, hundreds of millions of years. Sharing Professor Chamberlin's inspiring belief in the probability of racial longevity, do we not gain a real incentive to scientific research into the greater utilization of the forces of nature, an added argument for the application of the truths of science to civic progress, and a larger faith that the Golden Age is in the future—that the highest development of our country and of the world is to be witnessed by those who are to follow us? Are not our ideals practical and is not such a vision a call to larger service?

TREASURER'S NOTICE

In the annual report of the General Treasurer which is printed in the SIGMA XI QUARTERLY for March 1, 1915, on pages 20 and 21 several chapters are reported under date of December 31, 1914, as still owing assessments. Since the Treasurer's report was prepared these back assessments have been discharged by the Brown, California, Columbia, Indiana, Worcester Polytechnic, Purdue, and Washington (St. Louis) Chapters. The Treasurer regrets that his oversight or the shortness of time prevented proper acknowledgements in a foot note for all but the Brown Chapter.

The Nebraska Chapter still owes for the assessment of November 17, 1913; and the Nebraska and Rensselaer Chapters owe for the one of March 3, 1914. The call for the assessment of fifty cents per active member for 1915, was issued to the several chapters on May 4, and will be needed to meet the general obligations of the Society during the present year.

JAMES F. KEMP, *General Treasurer.*

CHAPTER REPORTS

The District of Columbia Chapter

The first active steps toward the formation of an alumni chapter of the Society of the Sigma Xi in the District of Columbia were taken on January 2, 1914, when Marcus Benjamin (Columbia), originator of the movement, Edmund Heller (Stanford), Marcus W. Lyon, Jr. (Brown), and Paul Bartsch (Iowa), met in the latter's office in the new National Museum to consider plans for the organization of such a chapter. Seven additional local members of the Sigma Xi representing various scientific activities in Washington and widely scattered universities were asked to associate themselves with the movement. These persons were: Dr. L. O. Howard (Cornell), Dr. B. H. Ransom (Nebraska), Dr. T. S. Palmer (California), Mr. F. J. Katz (Chicago), Dr. J. E. Pogue (Yale), Mr. W. R. Maxon (Syracuse), and Dr. B. W. Evermann (Indiana).

A majority of the members of this larger committee met one week later in Dr. Bartsch's office. Dr. Benjamin was chosen chairman and Dr. Lyon, secretary. Committees were appointed to draw up a constitution and by-laws, and to draft a letter to invite the local members of the Society to join in forming an alumni chapter.

The following week, January 16, 1914, the organization committee met again in the same place. After an informal discussion a tentative constitution and by-laws were adopted, and the secretary was instructed to send out the following letter:

> District of Columbia Chapter of the Sigma Xi
>
> Washington, D. C., January 23, 1914.
>
> You are invited to attend a meeting of members of Sigma Xi in Room 43, new building of the National Museum, on Friday, January 30, at 4 p. m.
>
> In recognition of the peculiar desirability and the need of a Chapter of Sigma Xi in this city, it is proposed to effect a permanent organization which shall petition the Council to charter an Alumni Chapter.
>
> Please indicate on the enclosed card whether or not you will be present, and mail it to the Secretary of the Organization Committee.
>
> Fraternally yours,
>
> The Organization Committee.

In response to this letter, on Friday, January 30, 1914, fifty-four local members of the Sigma Xi met at four o'clock in the afternoon, in Room 43 of the new National Museum building to consider the formation of the new chapter. Fifty other persons expressed by

card their desire to become members of the proposed chapter. The secretary had sent out 225 letters of invitation and had received 135 replies. The desirability of the formation of an alumni chapter was discussed and a letter from Professor J. McKeen Cattell, then President of the Society of the Sigma Xi, was read, expressing his pleasure at the organization of the proposed chapter.

The constitution and by-laws submitted by the organization committee were tentatively adopted. Dr. Benjamin was chosen as temporary president, and Dr. Lyon as temporary secretary-treasurer. The organization committee was instructed to continue the work of organization and to apply to the general Society for a charter.

On February 3, 1914, a formal letter of application for a charter was sent to President Cattell. This application contained the names of 109 local members of the Sigma Xi who had signified their desire for the chapter.

In a letter dated December 12, 1914, President Cattell notified Dr. Benjamin that the petition for the formation of the District of Columbia Chapter had gone the rounds of all the chapters of the Society, and that a charter would be granted to the local members of the Sigma Xi. The new chapter was asked to have representatives at the convention of the Society to be held in Philadelphia during Convocation Week. Doctors Bartsch, Ransom, and Lyon represented the chapter at that convention.

Two organizing meetings of the local members were held in the afternoon in Room 43 of the new National Museum building, one on February 19, and the other on March 5, 1915, at which a constitution and by-laws were adopted. There was a strong majority feeling that the alumni chapter should be composed only of those persons resident in the District of Columbia and vicinity who are already members of the Society. Therefore no provision has been made by the District of Columbia Chapter for the election of new members into the Society. At the second meeting, Professor H. S. Williams, one of the original founders of the Society at Cornell, was present and addressed the Chapter.

The constitution and by-laws are modeled after those of the parent Society. The officers are a president, vice-president, treasurer, elected for two years, and a secretary elected for four years. The officers with two other members elected for two years constitute the Council or executive committee of the Chapter. One

annual meeting for the election of officers and transaction of important business, and at least two other meetings are provided for each year.

The first annual meeting was held in the evening on April 30, 1915, in the Assembly Hall of the Cosmos Club, the place where most of the scientific societies in Washington hold their meetings. The first election of officers resulted as follows:

President—Marcus Benjamin (Columbia), National Museum.
Vice-president—Isaac King Phelps (Yale), Bureau of Chemistry.
Secretary—Marcus Ward Lyon, Jr. (Brown), George Washington University.
Treasurer—Daniel Roberts Harper 3rd (Pennsylvania), Bureau of Standards.
Councillor—Frederick Leslie Ransome (California), Geological Survey.
Councillor—Cornelius Lott Shear (Nebraska), Bureau of Plant Industry.

Following the election of officers, informal remarks were made by the President and many other members representing the various collegiate chapters of the Society, subsequent to which the Chapter adjourned and enjoyed a social hour with light refreshments.

The names of 171 charter, and so far the only members of this the first and only alumni chapter of the Society are printed below, together with their academic records, place of election to Sigma Xi (indicated by an asterisk following the institution's name), date of election, and occupation.

There is probably no other city in the United States in proportion to its size that has so large a number of members of the Society of Sigma Xi actively engaged in research work as Washington. A perusal of the list of names of members of the District of Columbia Chapter will give an idea as to the lines of work in which they are engaged and as to the wide range of the universities represented by them.

The main object of the chapter will be to establish fraternal and social relations among the local members. It has been the experience of the members during the organization that they have met delightful fellow-workers in science in fields remote from their own. It will hardly be necessary to try to encourage a spirit of active research among a body of men and women who are already professional investigators, and who hold important offices under the

National Government for what they have done and are doing in research along many lines. It is perhaps too early to say what shape the final policy of the Chapter will assume, but the Chapter has contemplated some public meetings at which subjects of broad scientific interest will be presented. It has been suggested that an occasional joint meeting with the Phi Beta Kappa Club of Washington would be of mutual advantage to both societies; many are members of both societies.

M. W. LYON, JR., *Secretary.*

LIST OF MEMBERS

George Moritz Albrecht, E.E., Minnesota*; 1906; Assistant Examiner, Patent Office.

Martin E. Anderson, E.E., Minnesota*; LL.B., National University Law School; 1901; Assistant Examiner, Patent Office.

George H. Ashley, M.E., Cornell; A.M., Stanford*; Ph.D., Geological Survey.

Samuel Henry Ayers, S.B., Massachusetts Institute of Technology; Chicago*; 1906; Bacteriologist, Dairy Revision, Department of Agriculture.

Herbert Stevens Bailey, A.B., Kansas*; B.S., Massachusetts Institute of Technology; 1902; Bureau of Chemistry.

William Salisbury Ballard, Illinois*; 1904; Assistant Pathologist, Bureau of Plant Industry.

Arnold Kent Balls, B.S., Pennsylvania*; 1912; Chemist.

Paul Bartsch, B.S., M.S., Ph.D., Iowa*; 1905, Curator, Marine Invertebrates, National Museum.

Walter Fee Baughman, B.S., Pennsylvania*; 1912; Bureau of Chemistry.

Rolla Kent Beattie, B.A., Cotner; B.Sc., M.A., Nebraska*; 1898; Plant Pathologist, Department of Agriculture.

Marcus Benjamin, Ph.B., Columbia*; A.M., Lafayette; Ph.D., Nashville; Sc.D., Pittsburgh; LL.D., St. Johns; 1905; Editor, National Museum.

William Nathan Berg, B.S., Ph.D., Columbia*; 1906; Biological Chemist, Bureau of Animal Industry.

Charles Louis Billard, M.D., Pennsylvania*; 1904; Physician.

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*Institution at which election to Sigma Xi took place, followed by date of election.

Charles John Brand, B.A., Minnesota*; 1902; Chief, Office of Markets and Rural Organization, Department of Agriculture.

Clark Arthur Briggs, B.S., E.E., A.M., Missouri*; 1907; Associate Physicist, Bureau of Standards.

Charles Brooks, Indiana*; Bureau of Plant Industry.

Edgar Brown, Ph.B., Union College; 1895; Botanist, Department of Agriculture.

Warren David Brush, B.S., Baldwin; M.A., Michigan*; 1906; Scientific Assistant, Forest Service.

Herbert Horace Bunzel, B.S., Ph.D., Chicago*; Berlin; Chemist.

George Kimball Burgess, B.S., Massachusetts Institute of Technology; Sc.D., Paris; California*; 1902; Physicist, Bureau of Standards.

Keivin Burns, B.A., Ph.D., Minnesota*; 1908; Spectroscopist, Bureau of Standards.

William Wesley Burr, B.Sc., Nebraska*; 1914; Assistant in Dry Land Investigations, Bureau of Plant Industry.

Harry E. Burton, B.A., M.S., Iowa*; 1905; Assistant, Naval Observatory.

Luther Parris Byars, B.S., Clemson College; M.S., Wisconsin*; 1913; Pathologist, Bureau of Plant Industry.

Frank Cathcart Calkins, B.S., California*; 1902; Geologist, Geological Survey.

Frank Kenneth Cameron, A.B., Ph.D., Johns Hopkins; Cornell*; 1895; Chemist, Bureau of Soils.

Theodore Sheffield Chapin, B.S., Occidental College; M.A., Stanford*; 1909; Geologist, Geological Survey.

Vera Katharine Charles, A.B., Cornell*; 1903 Assistant Mycologist, Department of Agriculture.

Victor King Chesnut, B.S., California*; 1910; Chemist, Bureau of Chemistry.

Earle Hart Clapp, A.B., Michigan*; 1905; Forester, Forest Service.

Arthur Brooks Clawson, A.B., Michigan*; 1905; Physiologist in Poisonous Plants Investigations, Department of Agriculture.

John Sebastian Conway, B.S., Pennsylvania*; 1899; Deputy Commissioner of Lighthouses, Lighthouse Service.

Frederick Vernon Coville, A.B., Cornell*; 1889; Botanist, Department of Agriculture.

Samuel Ebb Crumb, Kansas*; 1908; Bureau of Entomology.

Samuel Trask Dana, A.B., Bowdoin; M.F., Yale*; 1906; Forester, Forest Service.

Jehiel Davidson, B.S., Ph.D., Cornell*; 1914; Chemist, Bureau of Chemistry.

Charles Dearing, B.S., Missouri*; 1909; Assistant Pomologist, Department of Agriculture.

James Maurice Doran, Minnesota*; 1907; Chemist, Internal Revenue, Treasury Department.

Mayme Dworak, A.B., A.M., Nebraska*; 1913; Scientific Assistant, Bureau of Plant Industry, Seed Laboratory.

Howard Austin Edson, B.S., M.S., Vermont; Ph.D., Wisconsin*; 1913; Plant Pathologist, Bureau of Plant Industry.

Edward King Evatt, Michigan*; 1910; Navy Yard.

Barton Warren Evermann, B.S., A.M., Ph.D., Indiana*; 1905; Director, Museum of the California Academy of Sciences.

John Henry Fahrenbach, Yale*; 1911; Assistant, Forest Service.

George Augustus Geiger, A.B., Harvard; Ph.D., Columbia*; 1910; Chemist, Bureau of Chemistry.

Louis John Gillespie, Ph.B., Ph.D., Brown*; 1910; Soil Fertility Investigations, Bureau of Plant Industry.

Arthur Wellington Gray, A.B., California*; Ph.D., Berlin; 1905; Assistant in Physics, Bureau of Standards.

Harry Webster Graybill, Nebraska*; 1900; Assistant in Zoölogy, Bureau of Animal Industry.

Edward Lawrence Griffin, A.B., B.S., M.S., Kansas*; 1912; Chemist.

Maurice Crowther Hall, S.B., Colorado College; M.A., Nebraska*; Ph.D., George Washington; 1906; Assistant Zoölogist, Zoölogical Division, Bureau of Animal Industry.

Rufus Clifford Hall, B.S., Northwestern*; M.F., Yale; 1906; Forest Examiner, Forest Service.

James Harold Hance, Washington*; 1908; Assistant Geologist, Geological Survey.

Carl Falster Hanson, B.S., M.S., Kansas*; 1912; Laboratory Assistant in Physics, Bureau of Standards.

Daniel Roberts Harper 3rd, B.S., A.M., Ph.D., Pennsylvania*; 1905; Associate Physicist, Bureau of Standards.

Rollin Arthur Harris, Ph.B., Ph.D., Cornell*; 1890; U. S. Coast Survey.

Leonard Lee Harter, A.B., A.M., Nebraska*; 1911; Pathologist, Bureau of Plant Industry.

Carl Hartley, B.A., M.A., Nebraska*; 1914; Forest Pathologist, Bureau of Plant Industry.

Heinrich Hasselbring, B.S., Cornell*; Ph.D., Chicago; 1899; Physiologist, Bureau of Plant Industry.

Charles Elvin Haupt, Jr., A.M., Franklin and Marshall College; B.S., Pennsylvania*; 1905; Architect.

John Kerfoot Haywood, Cornell*; 1896; Chemist, Bureau of Chemistry.

George Grant Hedgcock, B.Sc., A.M., Nebraska*; Ph.D., Washington (St. Louis); 1901, Plant Pathologist, Bureau of Plant Industry.

Edmund Heller, Stanford*; 1909; Smithsonian Institution.

Carl August Hellmann, B.S., M.S., Illinois*; LL.B., National; M.P.L., George Washington; 1906, Assistant Examiner, Patent Office.

Lawrence Ilsley Hewes, Yale*; 1901; Engineer, Office of Public Roads.

Leland Ossian Howard, B.S., M.S., Cornell*; Ph.D., Georgetown; M.D., George Washington; LL.D., Pittsburgh; 1887; Chief of Bureau of Entomology, Department of Agriculture.

Winfield Scott Hubbard, Ph.G., Illinois; B.S., Michigan; M.A., Columbia; Ph.D., Wisconsin*; 1910; Organic Chemist, Bureau of Chemistry.

Claude Silbert Hudson, Illinois*; 1906; Chemist, Bureau of Chemistry.

Walter David Hunter, M.A., Nebraska*; 1897; Entomologist, Department of Agriculture.

William Albert Hyde, Yale*; 1901; Bureau of Ordnance, Navy Department.

Cora Anna Jacobs, A.B., A.M., Illinois*; 1909; Seed Analyst, Department of Agriculture.

Carl Oscar Johns, A.B., M.A., Bethany College (Kansas); Ph.B., Ph.D., Yale*; 1905; Organic Chemist, Bureau of Chemistry.

Hally Delila Mary Jolivette, B.A., M.A., Wisconsin; Ph.D., Stanford*; 1911; Botanist, Bureau of Plant Industry.

Frank James Katz, B.A., Wisconsin; Chicago*; 1907; Geologist, Geological Survey.

George Lawrence Keenan, B.S., M.A., Michigan*; 1912; Microanalyst, Bureau of Chemistry.

Karl Frederic Kellerman, Cornell*; 1900; Physiologist, Bureau of Plant Industry.

Charles Hanford Kendall, Cornell*; 1896; Railroad Engineer, Bureau of Engineering.

Edwin Kirk, Columbia*; 1907; Assistant Geologist, Geological Survey.

Louis Otto Kunkel, B.S., A.B., A.M., Ph.D., Missouri*; Washington; Columbia; 1909; Pathologist, Bureau of Plant Industry.

George Newton Lamb, B.Sc., A.M., Nebraska*; 1911; Forest Service.

Clyde Evert Leighty, A.B., Illinois Wesleyan; Ph.D., Cornell*; 1910; Agronomist, Bureau of Plant Industry.

Archibald Lindsey, A.B., A.M., Syracuse*; 1910; Assistant Examiner, Patent Office.

Alfred Erwin Livingston, B.S., M.S., Ohio; Ph.D., Cornell*; 1914; Junior Pharmacologist, Bureau of Chemistry.

Marcus Ward Lyon, Jr., Ph.B., Brown*; M.S., M.D., Columbia; Ph.D., George Washington; 1913; Professor Bacteriology and Pathology, George Washington University.

Burton McCollum, B.S., Kansas*; 1902; Electrical Engineer, Bureau of Standards.

Arthur Howard McCray, Ohio State*; 1909; Assistant, Bureau of Entomology, Department of Agriculture.

Norman Eugene McIndoo, A.B., A.M., Indiana*; Ph.D., Pennsylvania; 1909; Bureau of Entomology.

Stockton Mosby McMurran, B.S., Virginia Polytechnic Institute; A.M., Washington*; 1911; Plant Pathologist, Bureau of Plant Industry.

Donald Francis MacDonald, Chicago*; 1908; Geologist, Geological Survey.

James Cook Martin, Ph.B., Brown*; M.A., Ph.D., Princeton; 1909; Assistant Curator of Geology, National Museum.

Charles Frederick Marvin, M.E., Ohio State*; 1905; Chief of Weather Bureau.

William Ralph Maxon, Ph.B., Syracuse*; 1906; Botanist, Associate Curator, Division of Plants, National Museum.

Irving E. Melhus, B.S., Iowa State College; Ph.D., Wisconsin*; 1911; Plant Pathologist.

George Albert Menge, Ph.B., Ph.D., Yale*; 1903; Dairy Chemist, Department of Agriculture.

Haven Metcalf, A.B., A.M., Brown*; Ph.D., Nebraska; 1902; Pathologist, Bureau of Plant Industry.

Joseph McConnechy Michaelson, Cornell*; 1892; Expert Aid, Bureau of Yards and Docks, Navy Department.

Frank C. Miles, A.B., A.M., Nebraska*; 1914; Scientific Assistant, Department of Agriculture.

George Freeman Miles, B.Sc., Nebraska*; 1903; Pathologist, Department of Agriculture.

Fred Howard Moffit, B.A., Williams; M.A., Lafayette; Columbia*; 1903; Geologist, Geological Survey.

Louis Sutliffe Murphy, B.S., Tufts; M.F., Yale*; 1907; Forester, Forest Service.

Henry James Nichols, Yale*; 1901; M.D., Pennsylvania; Medical Officer, U. S. Army.

John DeWolf Northrup, Syracuse*; 1910; Geologist, Geological Survey.

Jesse Baker Norton, B.S., M.S., Kansas State Agricultural College; Cornell*; 1908 Plant Physiologist, Bureau of Plant Industry.

Herbert James Ord, Ph.B., C.E., Yale*; 1904; Structural Engineer, Division of Valuation, Isthmian Canal Commission.

Robert Wallace Pack, California*; 1908; Assistant Geologist, Survey.

Roscoe Milliken Packard, Western Reserve*; A.M., Brown; 1903; Assistant Examiner, Patent Office.

Samuel Palkin, Ph.B., Yale*; M.S., George Washington; 1910; Chemist, Bureau of Chemistry.

Howard Earle Palmer, B.A., Ph.D., Yale*; 1907; Chemist, Bureau of Chemistry.

Theodore Sherman Palmer, A.B., California*; M.D., Georgetown; 1910; Assistant in charge Game Preservation, Department of Agriculture.

John Bernard Parker, A.B., M.A., Ohio State*; 1908; Teacher, Catholic University of America.

George Edward Patrick, B.S., M.S., Cornell*; 1888; Chemist in charge of Dairy Laboratory, Bureau of Chemistry.

Caro Beth Peck, Northwestern*; 1908; Civil Service Commission.

Cyril E. Pemberton, Stanford*; 1911; Honolulu, Hawaii.

Isaac King Phelps, B.A., Ph.D., Yale*; M.A., Harvard; 1896; Chemist, Bureau of Chemistry.

Everett Franklin Phillips, A.B., Allegheny; Ph.D., Pennsylvania*; 1904; In charge of Bee Culture Investigations, Bureau of Entomology.

Edward Ferguson Pickford, A.B., Union*; M.D., Albany; 1889; Physician.

William Dwight Pierce, B.A., M.A., Nebraska*; 1904; Entomologist, Department of Agriculture.

Joseph Ezekiel Pogue, Jr., Yale*; 1909; U. S. Geological Survey.

Venus Worrell Pool, B.Sc., M.A., Nebraska*; 1908; Plant Pathologist, Bureau of Plant Industry.

Irwin G. Priest, A.B., Ohio State*; 1907; Physicist, Bureau of Standards.

Fred J. Pritchard, B.S., Nebraska*; 1904; Plant Physiologist, Bureau of Plant Industry.

Henry John Ramsey, B.S., South Dakota; M.A., Minnesota*; 1903; Pomologist, Bureau of Plant Industry.

George Atwater Rankin, A.B., Cornell*; 1907; Physical Chemist, Geophysical Laboratory.

Brayton Howard Ransom, B.Sc., M.A., Ph.D., Nebraska*; 1900; Zoölogist, Bureau of Animal Industry.

Frederick Leslie Ransome, B.S., Ph.D., California*; 1906; Geologist, Geological Survey.

Henry S. Rawdon, B.Ch.Eng., Michigan*; 1912; Assistant Physicist, Metallography, Bureau of Standards.

Effie Alberta Read, A.B. M.A., Ph.D. Cornell*; M.D., George Washington; 1903; Microanalyst, Bureau of Chemistry.

Ruric Creegan Roark, Illinois*; 1908; Bureau of Chemistry.

John William Roberts, A.B., A.M., Nebraska*; 1909; Pathologist, Bureau of Plant Industry.

Joseph Rosenbaum, B.S.A., Ph.D., Cornell*; 1913; Plant Pathologist, Bureau of Plant Industry.

Walter Edward Rosengarten, B.S., Pennsylvania*; 1911; Highway Engineer, Office of Public Roads.

Bert Russell, B.A., M.A., Minnesota*; LL.B., Georgetown; M.P.L., George Washington; 1902; Assistant Examiner, Patent Office.

William Salant, B.S., Cornell; M.D., Columbia*; 1905; Pharmacologist, Bureau of Chemistry.

John Walter Sale, A.B., De Pauw; M.A., Ohio State*; 1909; Chemist, Bureau of Chemistry.

Arthur William Sampson, B.Sc., A.M., Nebraska*; 1907; Forester.

DeAlton Saunders, A.B., A.M., Nebraska*; 1895; Plant Breeder, Department of Agriculture.

Lloyd Wave Schad, A.B., Western Reserve; B.S., Case*; 1914; Laboratory Assistant, Bureau of Standards.

Waldemar Theodore Schaller, B.S., California*; Ph.D., Munich; 1908; Mineralogist, Geological Survey.

Frederick John Schlink, B.S., Illinois*; 1912; Assistant Physicist, Bureau of Standards.

Alfred Reginald Schultz, B.S., Wisconsin; Ph.D., Chicago*; 1905; Geologist, Geological Survey.

Roscoe Hart Shaw, B.Sc., New Hampshire; Nebraska*; Zürich; 1906; Chemist.

Homer LeRoy Shantz, B.Sc., Colorado; Ph.D., Nebraska*; 1905; Plant Physiologist, Bureau of Plant Industry.

Cornelius Lott Shear, B.C., A.M., Nebraska*; Ph.D., George Washington; 1897; Plant Pathologist, Bureau of Plant Industry.

Charles Meldrum Smith, B.S., Pennsylvania*; 1910; Assistant Chemist, Bureau of Chemistry.

John Otterbein Snyder, Stanford*; 1902; Assistant Professor of Zoölogy, Leland Stanford Junior.

Arthur Coe Spencer, Case*; 1905; Geological Survey.

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